HY-DRO-GEN

User guide

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Word hyphenation via bindings to typst/hypher

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HY-DRO-GEN can split words into syllables in any supported language, which enables correct hyphenation. It includes the ability to dynamically load hyphenation patterns, enabling hyphenation also for languages or variants not natively supported by Typst.

HY-DRO-GEN is composed of

1. an internal WASM module that provides bindings to the hyphenation library natively used for Typst, typst/hypher,
2. a public layer to abstract away the internal details.

This manual is only concerned with the latter.

Contributions

If you have ideas for improvements, or if you encounter a bug, you are encouraged to contribute to HY-DRO-GEN by submitting a bug report, feature request, or pull request.

Versions

- `dev`
- `hy-dro-gen:0.1.2` (`latest`) → `hypher:0.1.6` forked to `83aa0d2`
- `hy-dro-gen:0.1.1` → `hypher:0.1.6`
- `hy-dro-gen:0.1.0` → `hypher:0.1.5`

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Part I

Quick start

Import the latest version of HY-DRO-GEN with:

```
1 #import "@preview/hy-dro-gen:0.1.2" as hy
```

The main function provided by HY-DRO-GEN is `#hy.syllables`, which takes as input a word and a language (specified by its ISO 639-1 code), and returns the word split by syllables. By default, the language is `"en"`, i.e. English.

`#hy.syllables("hydrogen")`	`("hy", "dro", "gen")`
`#hy.syllables("hydrogène", lang: "fr")`	`("hy", "dro", "gène")`
`#hy.syllables("υδρογόνο", lang: "el")`	`("υ", "δρο", "γό", "νο")`

Part II

Language validation

If a language is unsupported, the default behavior is a panic.

`#hy.syllables("hydrogène", lang: "xz")`	**panic: Invalid language**

In the eventuality that you need to hyphenate for an arbitrary language that is not guaranteed to be a valid ISO 639-1 code, it is recommend that you either validate the language or specify a fallback.

II.1 Existence check

The function `#hy.exists` checks if a language is natively supported. If `#hy.exists` returns `true`, a call of `#hy.syllables` is guaranteed to not panic given this language. Since all ISO 639-1 codes have two letters, any string of more than two letters given to this function will always produce `false`.

`#hy.exists("en")`	`true`
`#hy.exists("xz")`	`false`
`#hy.exists("foobar")`	`false`

Here is the list of all languages supported natively:

Code	Language		Code	Language		Code	Language
`"af"`	Afrikaans		`"sq"`	Albanian		`"be"`	Belarusian
`"bg"`	Bulgarian		`"ca"`	Catalan		`"hr"`	Croatian
`"cs"`	Czech		`"da"`	Danish		`"nl"`	Dutch
`"en"`	English		`"et"`	Estonian		`"fi"`	Finnish
`"fr"`	French		`"ka"`	Georgian		`"de"`	German
`"el"`	Greek		`"hu"`	Hungarian		`"is"`	Icelandic
`"it"`	Italian		`"ku"`	Kurmanji		`"la"`	Latin
`"lt"`	Lithuanian		`"mn"`	Mongolian		`"no"`	Norwegian
`"nb"`	Norwegian		`"nn"`	Norwegian		`"pl"`	Polish
`"pt"`	Portuguese		`"ru"`	Russian		`"sr"`	Serbian
`"sk"`	Slovak		`"sl"`	Slovenian		`"es"`	Spanish
`"sv"`	Swedish		`"tr"`	Turkish		`"tk"`	Turkmen
`"uk"`	Ukrainian						

The same list available via the static dictionary `#hy.languages`.

II.2 Fallback

Alternatively, you can provide a fallback strategy among:

- `auto`: languages that do not exist will silently be skipped,
- `str`: a valid ISO 639-1 code as a fallback will be used in the event that `⟨lang⟩` is invalid.

`#hy.syllables("hydrogène", lang: "xz")`	**panic: Invalid language**
`#hy.syllables("hydrogène", lang: "xz", fallback: auto)`	`("hydrogène",)`
`#hy.syllables("hydrogène", lang: "xz", fallback: "fr")`	`("hy", "dro", "gène")`

Part III
Dynamically loaded languages

> This feature is experimental and still lacks some validation. If you do not follow the instructions below you can end up with incomprehensible error messages.

III.1 Some background

As explained in the original blog post for hypher, hyphenation in Typst works by generating an automaton from a TEX pattern file. In practice this is implemented by the crate `hypher`. By default `hypher`, and thus Typst, embeds the automata for 35 (possibly soon 36) languages, but until issue #5223 lands, it is not currently possible to load custom patterns.

The ability to dynamically load patterns is however implemented by my own fork of hypher, and HY-DRO-GEN makes use of this capability.

III.2 Obtaining tries

Tries are loaded from TEX pattern files or precompiled binaries by `#hy.trie`. This section details how to obtain an object of type `trie` that you can then pass to `#hy.syllables`.

III.2.1 Download pattern files

There are a number of hyphenation pattern files available on hyphenation.org, of which quite a few are not available natively in Typst.

In what follows I assume that you have downloaded your pattern files, and saved them to `patterns/hyph-${iso}.tex`, replacing `${iso}` with whatever code the language you want to use has. Also note on hyphenation.org the column titled '(left,right)-hyphenmin'. This data will be important.

III.2.2 On-the-fly compilation

One way to obtain a trie is:

```
#let trie = hy.trie(
  tex: read("patterns/hyph-${iso}.tex"),
  bounds: hyphenmin,
)
```

For example to load Galician (`"gl"` patterns):

```
#let trie_gl = hy.trie(tex: read("patterns/hyph-gl.tex"), bounds: (2, 2))
```

This solution incurs a small one-time overhead to compile the trie from the patterns. You can avoid this overhead by following the instructions in Section III.2.3 and building a `trie` from a precompiled binary instead.

III.2.3 Precompilation

Install `hypher`

> This step is still very rough. It'll get better once some of my local changes have been upstreamed to typst/hypher.

The `.tex` pattern files need to be compiled to automata readable by hypher. First we need to install hypher locally as a binary. Currently the simplest way of doing so is:

```
# Download the fork of hypher that can compile tries
$ cd /tmp && git clone https://github.com/Vanille-N/hypher.git
# Install it locally
$ cargo install --path hypher --features bin
# Go back to your workspace and check that it works.
$ cd - && hypher --help
```

I hope that soon this process can be simplified to:

```
$ cargo install hypher --features bin
```

Compile and load the trie

With `hypher` now installed, run

```
$ mkdir -p tries
$ hypher build patterns/hyph-${iso}.tex tries/${iso}.bin
```

The resulting file is a valid input for `#hy.trie` in the following form:

```
#let trie = hy.trie(
  bin: read("tries/${iso}.bin", encoding: none),
  bounds: hyphenmin,
)
```

For example to load Galician (`"gl"` patterns), the entire process is:

```
$ hypher build patterns/hyph-gl.tex tries/gl.bin
```

```
#let trie_gl = hy.trie(
  bin: read("tries/gl.bin", encoding: none),
  bounds: (2, 2),
)
```

III.3 Loading patterns

Once you have obtained an object of type `trie` through either Section III.2.2 or Section III.2.3, you can use it as a ⟨lang⟩ for `#hy.syllables`.

```
#let trie_gl = hy.trie(
  tex: read("patterns/hyph-gl.tex"),
  bounds: (2, 2),
)
#hy.syllables("galego", lang: trie_gl)
```

```
("ga", "le", "go")
```

III.3.1 Manual

If you want to hyphenate a specific piece of text with a pattern, you could write for example:

```
#let trie_gl = hy.trie(
  bin: read("tries/gl.bin", encoding: none),
  bounds: (2, 2),
)
#show regex("\w+"): word => {
  syllables(word.text, lang: trie_gl).join([-?])
}
#text(lang: "gl")[#my-text]
```

III.3.2 Automatic

Altertatively, you can use `#hy.load-patterns` and `#hy.apply-patterns`. Behind the scenes they will perform almost the same manipulation as in Section III.3.1.

```
#let trie_gl = hy.trie(
  bin: read("tries/gl.bin", encoding: none),
  bounds: (2, 2),
)
#hy.load-patterns(
  gl: trie_gl,
  // accepts multiple pairs in the format 'iso: trie'
)
#show: hy.apply-patterns("gl")
#text(lang: "gl")[#my-text]
```

Part IV
API

#hy.apply-patterns #hy.load-patterns #hy.trie
#hy.exists #hy.syllables

↑ Since 0.1.2

#hy.apply-patterns(⟨iso⟩) → function

Apply show rules to hyphenate the specified language. The output is a (content)→content that can be used as #show rule for the rest of the document.

Argument

⟨iso⟩ iso

ISO 639-1 code of a language previously added by #hy.load-patterns.

#hy.exists(⟨iso⟩) → bool

Check if a code corresponds to a language that has **builtin** patterns. It does not (yet) take into account dynamically loaded languages.

See the list of officially supported languages at github:typst/hypher

If this function returns true, then an invocation of #hy.syllables with this language is guaranteed to not raise an "Invalid language" failure.

Argument

⟨iso⟩ iso

2-letter ISO 639-1 code, e.g "en", "fr", "el", etc.

↑ Since 0.1.2

#hy.load-patterns(..⟨args⟩) → content

Load new patterns dynamically.

Argument

..⟨args⟩ dictionary

One or more pairs of language iso code and its trie. This function expects objects of type trie, see #hy.trie for how to construct them.

```
#let trie_fr = hy.trie(..)
#let trie_en = hy.trie(..)
#load-patterns(
  fr: trie_fr,
  en: trie_en,
)
```

#hy.syllables(⟨word⟩, ⟨lang⟩: "en", ⟨fallback⟩: none, ⟨dyn⟩: false) → (..string,)

Splits a word into syllables according to available hyphenation patterns.

Argument

⟨word⟩ `str`

Word to split.

Argument

⟨lang⟩: "en" `iso` | `trie`

Either an ISO 639-1 code, or a `trie` built by #hy.trie.

Argument

⟨fallback⟩: none `none` | `auto` | `iso`

Determines the behavior in case `lang` is unsupported

- `none`: panics with “Invalid language”
- `auto`: the word is not split at all
- `iso`: use that instead

Argument

⟨dyn⟩: false `bool`

↑ Since 0.1.2

context

Look also in the dynamically loaded languages, i.e. valid values for ⟨lang⟩ now include not just the builtin ones but also those declared via #hy.load-patterns. Setting this to true will also make the function contextual.

↑ Since 0.1.2

#hy.trie(⟨bin⟩: none, ⟨tex⟩: none, ⟨bounds⟩: none, ⟨force⟩: false) → `trie`

Fetch hyphenation patterns from a file. Depending on the arguments, can load either precompiled bytes, or to-be-compiled patterns. Typically an invocation will look like one of:

```
#let trie_fr = hy.trie(
  bin: read("tries/fr.bin", encoding: none),
  bounds: (2, 3),
 )
#let trie_en = hy.trie(
  tex: read("patterns/hyph-en.tex"),
  bounds: (2, 3),
)
```

Argument

⟨bin⟩: none `bytes`

Bytes read from a `.bin` precompiled trie.

Exactly one of ⟨bin⟩ or ⟨tex⟩ must be specified.

Argument

`⟨tex⟩: none` `str`

String read from a `.tex` pattern file.

Exactly one of `⟨bin⟩` or `⟨tex⟩` must be specified.

Argument

`⟨bounds⟩: none` `(int, int)`

(left,right)-hyphenmin as specified by hyphenation.org

Argument

`⟨force⟩: false` `bool`

A heuristic panics if you give to `⟨tex⟩` data that looks like a filename, because it means you probably meant to `#read` it first. You can silence the warning in question by setting this to `true`.

`#languages` `dictionary`

Dictionary of builtin codes and languages, in the format:

```
1 (en: "English", fr: "French", ...)
```

This dictionary is expected but not guaranteed to be in sync with `#hy.exists`, because they are fetched through different means. (`#hy.exists` queries the actual WASM module, while `#languages` is generated from the source code of typst/hypher. If they are out of sync, this is a bug and `#hy.exists` is the authority for which languages are actually supported by `#hy.syllables`.

Part V
About

V.1 Useful resources

- How to put 30 Languages Into 1.1MB is the blog post that introduced typst/hypher,
- https://www.hyphenation.org/ is a repository of hyphenation patterns.

V.2 Dependencies

HY-DRO-GEN is obviously dependent on typst/hypher its main dependency. Currently it actually uses a fork Vanille-N/hypher, since dynamically loading tries is not supported by typst/hypher, but I am open to upstreaming all the features that the Typst project finds desirable.

This manual is built with MANTYS and TIDY.